Series (2) is equivalent to $\frac{1}{2!}+\frac{2}{3!}+\frac{3}{4!}$..............$\frac{n}{(n+1)\,!}$..............

*This becomes $\sum_{n=1}^{\infty}\frac{n}{n+1!}=\sum_{n=1}^{\infty}\left(\frac{1}{n!}-\frac{1}{(n+1)\,!}\right)=1.$

**Also solved by G. B. M. Zerr, and the Proposer.**

## AVERAGE AND PROBABILITY.

**165. Proposed by HENRY HEATON, Atlantic, Iowa.**

What is the average length of all straight lines that can be drawn within a given square parallel to one of the diagonals?

**I. Solution by R. D. CARMICHAEL, Hartselle, Ala.**

Their intersections along the other diagonal will be evenly distributed. The average length is thus readily seen to be one-half the diagonal$=\frac{1}{2}a\sqrt{2}$, where $a$=the side of the square.

**II. Solution by J. EDWARD SANDERS, Hackney, Ohio.**

Since the greatest length is $a\sqrt{2}$, and the least 0, the average length is $\frac{1}{2}(a\sqrt{2}+0)=\frac{1}{2}a\sqrt{2}$; or by calculus,

$$\Delta=\frac{1}{a}\int_0^a x\sqrt{2}\,dx=\tfrac{1}{2}a\sqrt{2}.$$

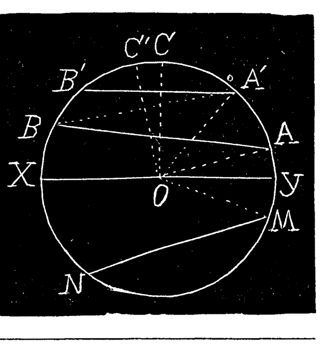
**Also solved by F. P. Matz, and G. B. M. Zerr.**

**166. Proposed by F. P. MATZ, Sc. D., Ph. D.**

Find the average area intercepted by two non-intersecting chords drawn at random in a given circle.

**Solution by the PROPOSER.**

*First Case.* The two chords $AB$ and $A'B'$ may be on the *same* side of the diameter $XY$.




Let $OA=r$, $\angle OAB=\theta$, $\angle OA'B'=\phi$, $\angle YOA'=\psi$, and $\angle YOA=\omega$; then area

$AA'B'B=U_1=(\phi-\theta+\sin\phi\cos\phi-\sin\theta\cos\theta)r^2$.

$$\therefore A_1=\frac{\int_0^{\frac{1}{2}\pi}\int_\theta^{\frac{1}{2}\pi}\int_0^{2\pi}\int_\omega^{\frac{1}{2}\pi}U_1\,d\theta\,d\phi\,d\omega\,d\psi}{\int_0^{\frac{1}{2}\pi}\int_\theta^{\frac{1}{2}\pi}\int_0^{2\pi}\int_\omega^{\frac{1}{2}\pi}d\theta\,d\phi\,d\omega\,d\psi}$$

*C. Smith, *Treatise on Algebra*, p. 396, Ex. 2.